REMARKS

Summary

This Amendment is responsive to the Office Action mailed on December 4, 2003. Claims 1, 9, 10, 13, 14, 19, 20, 24, 25, 26, 27, and 39 are amended herein. Claim 2 is cancelled. Claims 40 and 41 are new. Claims 1 and 3-41 are pending.

The Examiner has objected to the Information Disclosure Statement (IDS) filed on January 8, 2001 as the copies of the reference were not present in the application file. As discussed with the Examiner on March 2, 2004, Applicants submitted copies of the references with the January 8, 2001 IDS. The Examiner indicated that these references were apparently lost at the Patent Office. As discussed with the Examiner, attached are copies of the references cited in Applicants' January 8, 2001 IDS, together with a copy of Applicants' form PTO-1449 submitted with that IDS. Applicants respectfully request that the Examiner consider the references and initial and return the PTO-1449 form with the next official communication.

Claims 1-3, 9-12, 16-18, and 26 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Huang (US 6,570,888).

Claims 4-8, 13-15, and 19-25 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Huang in view of Zhang (US 6,483,543).

Claims 27, 29-34, and 37-39 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhang in view of Balakrishnan (US 5,566,208).

Claim 28 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Zhang in view of Wang (US 6,643,327).

Applicants respectfully traverse these rejections in view of the amended claims and the following comments.

Discussion of Amended Claims

Claims 1 and 9 are amended to include the subject matter of original claim 2. Claim 2 is cancelled to avoid duplication of claimed subject matter.

Claim 10 is amended into independent form by the addition of the subject matter of original claims 19 and 20.

Claim 13 is amended to conform to the amendments to claim 10.

Claim 14 is amended into independent form by the addition of the subject matter of original claim 10.

Claim 19 is amended to depend from claim 14.

Claim 20 is amended to clarify that the maximum and minimum values are predicted values.

Claim 24 is amended into independent form by the addition of the subject matter original claims 10 and 19.

Claim 25 is amended to depend from claim 24.

Claim 26 is amended to include the subject matter of original claims 19 and 20. Claims 10 and 26 are also amended to clarify that the maximum and minimum values are predicted values.

In addition, each of the independent claims 1, 9, 10, 14, 24, 26, 27, and 39 are amended to specify that the plurality of channels comprise encoded data or video frames, thereby clarifying that Applicants' invention is

applicable to transcoding of encoded data, rather than the initial encoding of raw data.

New claim 40 is based on a combination of original claims 26 and 14.

New claim 41 is based on a combination of original claims 19, 24, and 26.

New claims 40 and 41 also specify that the channels comprise encoded video frames.

Discussion of Cited References

The Examiner has rejected claims 1-3, 9-12, 16-18, and 26 as being anticipated by Huang. This rejection is respectfully traversed. An anticipation rejection requires that each and every element of the claimed invention as set forth in the claim be provided in the cited reference. See *Akamai Technologies Inc. v. Cable & Wireless Internet Services Inc.*, 68 USPQ2d 1186 (CA FC 2003), and cases cited therein. As discussed in detail below, Huang does not meet the requirements for an anticipation rejection.

Huang discloses techniques for determining an output rate for a bit stream by applying information read from the bitstream to a model of a receiver for the bitstream. These techniquers are used to construct a statistical multiplexer (Abstract). Huang is not related to statistical remultiplexing in a transcoder, as is claimed by Applicants.

Applicants' claimed invention relates to statistical remultiplexing in a transcoder which receives a plurality of encoded video streams, each of which is at respective first bit rates, and re-encodes the video streams at

respective second bit rates, as necessary for statistical remultiplexing.

Huang does not disclose or remotely suggest statistical remultiplexing of encoded video streams, as set forth in Applicants' claims.

<u>Claims 1 and 9</u>

Claims 1 and 9 are amended herein to include the subject matter of claim 2. In particular, claims 1 and 9 are amended to specify that the video frames are stored in a lookahead buffer in order to delay transcoding of the video frames while obtaining statistical information therefrom. The Examiner has rejected claims 1, 2, and 9 as being anticipated by Huang.

As indicated by the Examiner, Huang discloses storing the video frame in a statistical multiplex buffer (SMB 507) to achieve a delay (Col. 9, lines 18-26; Figure 5). However, the arrangement and function of the SMB 507 of Huang is not equivalent to Applicants' claimed lookahead buffer, which stores the video frames <u>in order to delay transcoding</u> of the video frames while statistical information is obtained from the video frames.

In Huang, the delay provided by SMB 507 is <u>between</u> the encoder 107, which provides compression of the video data, and the multiplexing switch 511, as follows:

Input raw video →*Encoder (compression)* → *SMB (Delay)* → *MUX* → *Output*

In contrast, the lookahead buffer of Applicants' claimed invention is arranged <u>before</u> the transcoder and the remultiplexer, as follows:

Input encoded video → *Lookahead buffer(Delay)* → *Transcoder* → *MUX* → *Output*

Since the delay provided by Applicants' lookahead buffer is achieved <u>before transcoding</u>, <u>a priori</u> <u>statistical information regarding the encoded input video streams may be used to optimize the transcoding</u>. In contrast, since the SMB 507 of Huang is arranged <u>after the encoder</u>, statistical information obtained during the delay cannot be used during the encoding of the raw video data stored in the buffer 507, <u>since that data is already encoded</u>. In Huang, the SMB 507 is used to buffer the <u>encoded</u> bursty data before it is delivered to packet delivery controller 419. A meter 505 monitors the fullness of SMB 507 and provides information concerning the degree of fullness to TRC 413, which uses this information to vary the range of bit rates it provides to packet delivery controller 419 as required to keep SMB 507 from overflowing or underflowing (Col. 9, lines 34-47). The degree of buffer fullness may be <u>fed back</u> from meter 505 to the encoder 107, and used there to <u>increase or decrease the encoding rate of the remainder of the bit stream</u> (Col. 9, lines 47-49).

Huang does not disclose or remotely suggest storing the video frames in a lookahead buffer <u>in order to delay transcoding of the video frames while obtaining statistical information</u> therefrom for use in trasncoding, as claimed by Applicants in claims 1 and 9. In particular, Huang does not discuss <u>transcoding</u>. Further, the delay in Huang occurs <u>after the bit stream is encoded</u>, so that there is no delay of encoding or transcoding of the video frames while the statistical information is obtained.

Therefore, Huang does not disclose or remotely suggest determining respective bit rate need parameters for the

video frames <u>according to the statistical information</u>
<u>obtained during the delay</u> and <u>transcoding the respective</u>
<u>video frames in accordance with the respective bit rate</u>
<u>need parameters following the delaying thereof</u>, as claimed
by Applicants.

As Huang does not disclose each and every element of
the invention as claimed in claims 1 and 9, the rejections
under 35 U.S.C. § 102(e) are believed to be improper, and
withdrawal of the rejections is respectfully requested.
See, *Akamai Technologies Inc., supra*.

Claims 10 and 26

Claims 10 and 26 are amended to include the subject
matter of claims 19 and 20. In particular, claims 10 and 26
now specify computing a target frame size for the
particular video frame that indicates an amount of data
that is expected to result from transcoding the particular
video frame, wherein <u>the target frame size is bounded by at</u>
<u>least one of minimum and maximum predicted values that are</u>
<u>updated in the successive intervals</u> and the transcoding bit
rate for the particular video frame in the successive
intervals is determined in accordance with the target frame
size.

The Examiner has rejected the subject matter of claims
19 and 20 as being unptatentable over Huang in view of
Zhang. In particular, the Examiner indicated that the
subject matter of claim 20 is disclosed in Huang (Office
Action, page 10-11). While Huang does disclose meter 505
which monitors the fullness of buffer (SMB) 507 to prevent
buffer overflow or buffer underflow, <u>this computation is</u>

made after the bits are generated (i.e., after encoding) and are sent to buffer 507 (Col. 9, lines 42-44).

In contrast, with Applicants' claimed invention as set forth in claims 10 and 26, the target frame size is the amount of data <u>expected to result</u> from the transcoding. Accordingly, the minimum and maximum values which bound the target frame size are <u>predicted values</u> which are determined <u>before transcoding</u> of the video frames. With Applicants' claimed invention, the target frame size and the minimum and maximum predicted values which bound the target frame size are parameters <u>used to guide the transcoding process</u>. Bit allocation and picture quality are optimized when the application of minimum/maximum bit rate constraints is minimized.

Huang does not disclose or remotely suggest computing a target frame size for the particular video frame that indicates the amount of data that is <u>expected to result</u> from transcoding of the particular video frame, <u>which target frame size is bounded by minimum and maximum predicted values that are updated at successive intervals.</u>

Further, combining the function of the meter 505 of Huang with the disclosure of Zhang as suggested by the Examiner would not lead one skilled in the art to Applicants' invention as set forth in claims 10 and 26, since as discussed above the buffer fullness determination of Huang is made <u>after the bits are encoded</u> and sent to the buffer.

Claims 14 and 40

Claim 14 is amended into independent form. New claim 40 is the apparatus equivalent of method claim 14. Claims

14 and 40 specify computing a target frame size for each
video frame that indicates an amount of data that is
expected to result from transcoding thereof, wherein <u>video
frames whose associated target frame size is within a
predetermined difference from a number of pre-transcoding
bits thereof bypass transcoding</u>.

Claim 14 is rejected as being unpatentable over Huang
in view of Zhang. The Examiner indicates that Zhang
discloses bypassing transcoding of data if the expected
transcoding results do not achieve any further optimization
of the output bandwidth (Office Action, page 9). Zhang does
discuss bypassing transcoding of a particular frame if the
output channel is capable of handling the signal without
further recoding (Col. 17, lines 22-25). However, those
skilled in the art would only bypass transcoding of the
frame if the input frame size is <u>smaller than the target
frame size</u>.

However, as transcoding typically degrades picture
quality and requires additional processing cycles, the
present invention <u>bypasses transcoding even where the input
frame size is slightly larger than the target frame size</u>
(i.e., within a <u>predetermined difference</u> of the target
frame size). By bypassing the transcoding of such slightly
larger frames, better rate control can be achieved and
bits may be borrowed from other frames to optimize overall
processing efficiency and picture quality.

The combination of Huang and Zhang does not disclose
or remotely suggest to <u>bypass transcoding</u> of video frames
whose associated target frame size is <u>within a
predetermined difference from a number of pre-transcoding
bits thereof</u>, as set forth in Applicants' claims 14 and 40.

Claims 24 and 41

Claim 24 is amended into independent form and includes
the subject matter of claims 10 and 19. New claim 41 is the
apparatus equivalent of method claim 24. Claims 24 and 41
specify estimating a time for inserting clock reference
data into at least one packet comprising transcoded data of
the particular video frame according to the target frame
size.

The Examiner has rejected claim 24 as being
unpatentable over Huang in view of Zhang. In particular,
the Examiner has indicated that Huang discloses the
features of Applicants' claim 24 (Office Action, page 11).
As discussed above, Huang does not transcode encoded video
frames. Huang is concerned with encoding raw video data.
Therefore, the locations of the program clock references
(PCRs) of Huang can be easily preserved during the encoding
process. However, when a bitstream is transcoded, the
number of output packets is different from the number of
input packets. Therefore, it would not have been obvious in
view of Huang to estimate the time for inserting the clock
reference data (PCR packets) into the output transcoded
data, as claimed by Applicants in claims 24 and 41.

Therefore, the combination of Huang and Zhang does not
disclose or remotely suggest estimating a time for
inserting clock reference data into at least one packet
comprising transcoded data of the particular video frame
according to the target frame size, as set forth in
Applicants' claims 24 and 41.

Claims 27 and 39

Claims 27 and 39 are rejected as being unpatentable over Zhang in view of Balakrishnan. In particular, the Examiner indicates that Balakrishnan discloses using a compression ratio of input bits to output bits that varies with the content of the digital information (Office Action, page 13).

However, Balakrishnan does not disclose how to use the "compression ratio" to control the quantizer scale, as set forth in Applicants' claims 27 and 39. The compression ratio is the concept of the ratio of the input bit rate versus the output bit rate. However, the compression ratio does not automatically imply the ratio of the quantizer scales, as suggested by the Examiner. Further, with Applicants' invention, the compression ratio is used to relate the input (old) quantizer scale to the output quantizer scale. This algorithm ensures that the output quantization scale is higher than the input quantization scale. Applicants' respectfully submit that such a result would not have been obvious to one skilled in the art without the use of clipping and/or clamping techniques.

The combination of Zhang and Balakrishnan does not disclose or remotely suggest determining new quantization scales for use in transcoding corresponding macroblocks in a first portion of the particular video frame in accordance with (a) the corresponding old quantization scales, and a ratio of (b) a pre-transcoding amount of data in the particular video frame to (c) the target amount of data, as set forth in Applicants' claims 27 and 39.

Discussion of Wang

The Examiner has rejected claim 28 as being unpatentable over Zhang in view of Wang.

The Wang patent and the present application are commonly owned by General Instrument Corporation. General Instrument Corporation is the assignee of the Wang patent. General Instrument Corporation is also the assignee of the present application.

At the time the invention described in the present application was made, the present application and the Wang patent were owned by, or subject to an assignment to, the same entity, General Instrument Corporation. Further, the Wang patent is potentially relevant only under 35 U.S.C. § 102(e)(2), since its issue date is subsequent to the filing date of the present application. Therefore, 35 U.S.C. § 103(c) prohibits the Wang patent from being used as a reference against the present application. Therefore, Applicant respectfully requests that the Wang patent be removed as a reference against the present application (see, 35 U.S.C. S 103(c) and MPEP § 706.02(l)(2), et seq.).

Applicants respectfully submit that the present invention is not anticipated by and would not have been obvious in view of Huang or Zhang, taken alone or in combination with any of the other prior art of record.
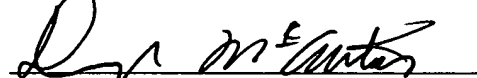
Further remarks regarding the asserted relationship between Applicants' claims and the prior art are not deemed necessary, in view of the foregoing discussion. Applicants' silence as to any of the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

Withdrawal of the rejections under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) is therefore respectfully requested.

Conclusion

The Examiner is respectfully requested to reconsider this application, allow each of the pending claims and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,

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